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Research Article

ECOBIOLOGY OF THE ROUNDED PIERROT *TARUCUS NARA* (KOLLAR) (LEPIDOPTERA: RHOPALOCERA: LYCAENIDAE) IN SOUTHERN ANDHRA PRADESH

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ABSTRACT
The rounded pierrot *Tarucus nara* (Kollar) available throughout the year in the environs of Lankamalai (14°45' - 14°72' N & 79°07' - 78°80' E) vegetation. It is on wings abundantly during August – October, field data on population index (eggs, larva, pupal success, and adult emergence) confirmed its availability. It lays eggs singly on *Zizuphus jujuba* a common tree in this area. The eggs hatch after 3-4 days of incubation, and the larvae passes through four instar and the total time for development from egg to adultemergence was 22- 27 days and at least 12-13 broods are expected in the season. Nutritional indices CI (consumption index) and AD (approximate digestibility) decreased as the larvae aged, GR (growth rate) increase from first instar to final instar. Both ECI (efficiency of conversion of ingested food) and ECD (efficiency of conversion of digested food) showed an increasing trend from first to final instar.

Key Words: *Tarucus Nara, Zizyphus Jujuba, Instars, Life History*

INTRODUCTION
Tarucus nara (Kollar) is chiefly tropical and subtropical in distribution (Kehimkar, 2008). The genus *Tarucus* with three species occur in India. One of the species *Tarucus nara* was common in South India (Kunte, 2000 and Venkata Ramana, 2011) and other two are rare in distribution. Primarily it was a low elevation butterfly endemic to Sri Lanka, Nepal, Pakistan and India (Kehimkar, 2008). There is an increasing interest all over the world in butterfly conservation (New *et al*, 1995). Lack of complete eco biological knowledge of the concerned species including the breeding habitat was considered to be the reason for such declines and extinctions. Total knowledge of the 'species biology' help to define management needs. In India where the exact status of several species of butterflies was not clearly known and where there was accelerated distribution of forests and other natural areas giving way to urbanization, the need for complete knowledge of the butterfly species' biology was becoming more urgent for taking up appropriate conservation measures (Gay *et al*, 1992).Nearly 49 species of butterflies occur in the environs of Lankamalai region and a complete study of their cycles are in progress. Now we describe here the life cycle and population index of the rounded Pierrot butterfly *Tarucus nara*. Measurement of adults, eggs, larvae and pupae given here are based on ten samples each.

MATERIALS AND METHODS
Study areas were regularly searched for the reproductive activity of the *Tarucus nara* was found laying eggs on *Zizyphus jujuba*. The eggs with the leaf material were brought to the laboratory and incubated and further developmental stages were followed and the success rates of egg hatching, larval and pupal development was also recorded. Young leaves were supplied daily to the growing larvae. Particulars of the larval, pupal stages and the time of adult emergence were recorded from close observations. Searches were made every month for recording the different life stages – egg, larvae, and pupae on 50 plants of *Zizyphus jujuba* to work out population index. Food consumption and the growth of the larvae at each instar stage were measured. The food utilization indices were also measured and calculated following Waldbauer (1968) formula. Five replications were made in respect of each parameters of food efficiency. The weights were expressed in the units of milligrams. The relation between food consumption and growth of larvae was analyzed statistically by using Karl Pearson's correlation and regression equation.

RESULTS AND DISCUSSION

Oviposition host plants

This butterfly found both in plains and hill regions of Lankamalai, flying at low heights throughout the year recorded and abundant after rainy season. It heavily feeds on the floral nectar of this plant *Zizyphus jujuba* and uses the same plant for oviposition and larval feeding. They fly close to ground and mud puddles. The species life cycle and ecobiology was studied based on ten samples.

Adult

The rounded pierrot butterflies belongs to lycaenidae family. They are sexually dimorphic; males are dull violet blue on upper wing with a cell spot on upper forewing. Females are dull brown on upper wings and bear a tail at the end of hind wing. Colour markings are variable, especially in wet season forms. Underneath of wings are having prominent black streaks on white background, with a wing span of 23- 29 mm, feeds on *Zizyphus* sp. flowers They are univalent, lays single egg at a time under the leaves of host plant. They lay eggs during 10 am to 2 pm. They are on wings during mid day.

Life cycle

The eggs are laid singly underneath the leaves of Zizyphus *jujuba* plant. They are pale bluish green, round with flat bottom, attached to the leaf. The eggs incubated at room temperature of about 29 ^{o} C hatched in about 3-4 days. Before hatching they become dull in colour. At first instar the newly hatched larvae are green in colour, body was segmented and it measures 3.0 - 3.2 mm (3.1 + 0.004 mm). It is flat on the bottom side and semicircle over the dorsal side. The anterior and posterior ends are semicircle and flat. At the lateral side fine sensory hair are present. A prominent streak can be seen on the dorsal side from anterior to posterior end. At the anterior end behind the second segment in the middle of the band the red markings are found at the posterior end. A black patch can be seen outside the band. The patch on front side appears as if it is broken up. The mouth is on dorsal side, it comes out as a protuberance during feeding time, and we can observe leaf defoliation method of feeding. This instar continues for 2to3 days and grows to 4.5 – 5.5 mm (5.2+ 0.02 mm) by the end of the first instar. The second instar stage remains for 2 to 3 days and grows up to 7.2 – 7.5 mm (7.3 + 0.02). The growth can be seen both length wise and width wise. The red marks on the anterior region become dark in colour. Its head was 1.5 – 1.8 mm (1.6+ 0.002 mm) long. The third instar feed most of the time than the first two instars and it grows up to 9.1 – 9.6 mm (9.3+ 0.008 mm) long and body colour becomes darken. This stage lasts for 2-3 days. The fourth instar stage remains for 5 to 6 days. The red marks at the anterior end disappear. At this stage it feeds voraciously and grows up to 12.5 – 13.0 mm (12.8 + 0.007 mm). The larva undergoes contraction and thus becomes short and thick. The instar remains in pink colour for 2 days.

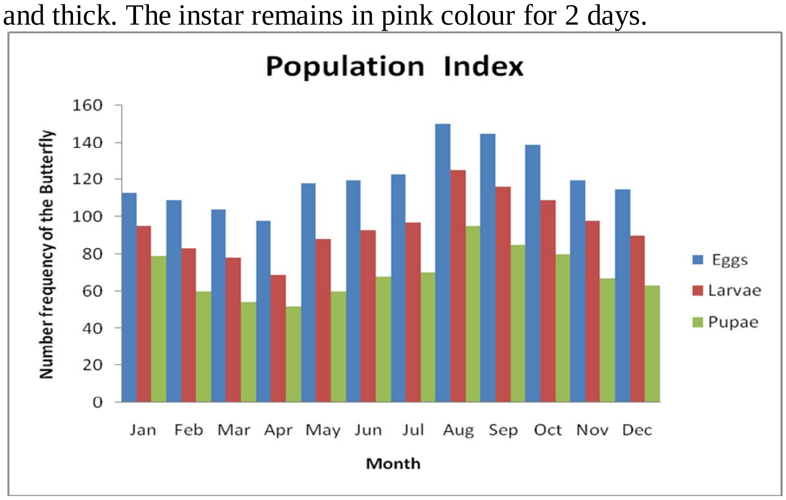


Figure 1: Population index of eggs, larvae, pupae of *Tarucus nara* based on the searches of 50 *Zizyphus jujuba* plants

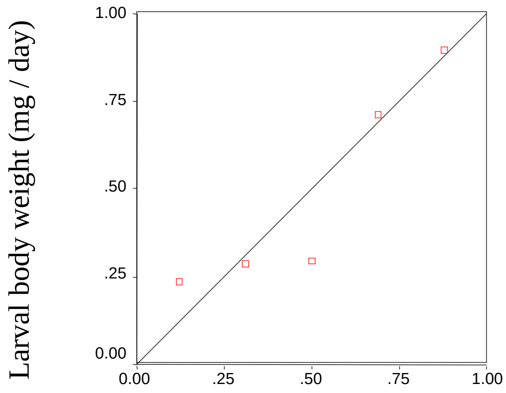
Population Index

The fine hair on the lateral side generally lost and forms shell around it and this stage last for one day. The pupal stage last for 6 – 7 days. The pupa is dark brown in colour with blunt end at the posterior end and anterior end broad with a small bulge on the top side which is 8.0 – 9.1 mm (8.6 +0.003 mm). Towards anterior side we can see three prominent stripes. The entire life cycle completes in 22- 27 days.
The numerical frequency of the natural occurrence of the life stages – eggs, larvae and pupae, on the host plant (*Zizyphus jujuba*) are given in figure-1. All the stages were spotted out throughout the year in the study locality. However, there was a higher frequency of occurrence of the life stages during August to October, which corresponds post monsoon in study locality.

Table 1: Food consumption and utilization efficiencies of *Tarucus nara* larva on *Zizyphus jujube* leaves

Instar No	Weight of food ingested (mg)	Wt. of faeces (mg)	Wt. gain by larva (mg)
I	0.1810±0.28	0.007±0.02	0.004±0.17
II	0.2650±1.6	0.07±0.42	0.016±0.52
III	0.2910±2.3	0.089±0.8	0.042±1.53
IV	0.3470±4.1	0.180±1.3	0.059±2.3

Food indices
The data relatively to the quantitative assessment of food consumption, weight gain and the values of five nutritional indices for different instars are given in table -1. The food consumption and weight that gain by the successive instars ran on similar lines. Regression of weight gain on food intake revealed a straight line relationship (figure-2) between the two events with correlation coefficient obtain at r value (r = 0.972) at 0.01 level & t value=8.820 with 0.003 significance. This reveals the significance, between the food intake and weight gained with advances of instar. The values of relative growth decreased and consumption index tended to increase from instar II to IV, instar I had a highest value of Consumption index. The values of AD decreased through instars, the values of both ECD and ECI showed a similar pattern with an increase from instars I to IV. The CI valves range from (0.29 - 0.42), the first stage has very high value later it gradually increases from instar II to instar IV. The high consumption index of early instars and corresponding low ECI is due to low conversion efficiency of ingested food. GR range from (0.254 – 3.67), Scriber and Feeny (1979) found higher growth rates in penultimate than in final instars. The GR of penultimate and final instars of butterfly species of present study is in line with the increasing trend in growth rate from penultimate to final instars. Thus, an increase in both consumption and growth occurred through the larvae ages. Such increase was considered essential to accumulate energy-rich fat to meet the metabolic requirements of non-feeding pupal and adult stages (Waldbauer 1968; Delvi and Pandian 1972; Pandian 1973; Downer and Matthews 1976; Slansky and Scriber 1985). AD valves range from (81.5-46.41). This shows there is significance growth rate and food consumed. The decrease in AD values signifies the selective feeding of last stage instar as the host plant has high nutritional levels. The larvae ingest a larger proportion of indigestible crude fibre as they become aged which influences AD values to decrease along the successive instars (Waldbauer 1968; Bailey and Mukerji 1976; Kogan 1986). The values of ECD across the instars showed an increasing trend (11.21 – 48.20) from early to late instars. An inverse relation was expected between assimilation efficiency AD (81.5 – 46.41) and efficiency of conversion of digested food or net conversion efficiency ECD (11.21 – 48.20).



Total food consumption (mg / day)

Figure 2: Relationship between food consumption and growth in *Tarucus nara*

Table 2: Food indices of larval stages of Tarucus nara

Instar No	GR (mg/day/mg)	CI (mg/day/mg)	AD %	ECD %	ECI %
I	0.254	0.52	81.5	11.21	9.13
II	0.823	0.29	69.72	22.12	15.42
III	2.41	0.39	65.72	30.18	32.97
IV	3.67	0.42	46.41	48.20	36.29

Present study values correlates with the above statement. The efficiency conversion of digested food increases signifies the high utilization of digested food for successive growth. Efficiency of conversion of ingested food or gross conversion efficiency ECI is a product of AD and ECD (Waldbauer 1968).The values of ECI may increase, decreases or show little changes depending on the extent to which the changes in AD and ECD compensate each other (Slansky and Scriber 1985). The ECI values in the present study varied (9.13 to 36.29). They showed a continuous increase from first instar to late instar. The greater ECI values show the ideal growth and food conversion to biomass though consumed at slower rate and high ECD values (11.21- 48.20) shows efficiency of assimilated food between biomass production and metabolic costs as the instars grows.

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REFERENCES

Bailey CG and Mukerji MK (1976). Consumption and utilization of various host plants by *Melanoplus bivittatus* (Say) and *M.femurrubrum* (De Geer) (Orthopter : Acrididae). *Canada Journal of Zoology* **54(7)** 1044 – 1050.

Downer RGH and Mathews JR (1976). Patterns of lipid distribution and utilization in insects. *American Zoology*. **16(4)** 733-745.

Delvi MR and Pandian TJ (1972). Rates of feeding and assimilation in the grasshopper *Poecilocerus pictus*. *Journal of insect Physiology* **18(9)** 1829-1843.

Kehimkar I (2008). The book of Indian Butterflies. *Bombay natural history society* (Oxford University press, Oxford, New York) 497.

Kogan M (1986). Bioassays for measuring quality of insect food, chapter 6 155-189. In : *Insect – plant Interactions*, edited by Miller J.RR. and Miller T.A. (Springer-Verlag, NewYork).

Kunte K (2000). Buterflies of Peninsular India. (University Press, Hyderabad) 254.

New TR, Pyle RM, Thomas JA, Thomas CD and Hammona PC (1995). Butterfly conservation and management. *Annual Review of Entomology* **40** 57-83.

Gay T, Kehimkar ID and Punetha JC (1992). Common Butterflies of India. (Oxford University Press).

Owen DF (1971). Tropical Butterflies. Clarendon Press.

Opler PA and Krizek GO (1984). Butterflies: East of the Great Plains. The John Hopkins University Press.

Pandian TJ (1973). Food intake and energy expenditure patterns in two insect primary consumers. Current Science **42(12)** 423-425.

Scriber JM and Feeny P (1979). Growth of herbivorous caterpillars in relation to feeding specialization and to the growth form of their food plants. *Ecology* **60** 829-850.

Scriber JM and Slansky FJ (1985). The nutritional ecology of immature insects. *Annual Review of Entomology* **26** 183-211.

Venkata Ramana SP (2011). The Flying jewels – Butterflies. Sri Venkateswara publications, Kadapa. Andhra Pradesh.

Waldbauer GP (1968). The consumption and utilization of food by insects, *Advances in Insect Physiology* edited by Beament, Treherne, and Wigglesworth, Academic press, London and Newyork.